How to Launch a Networked Improvement Community: Lessons from the *BetterBook* project

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Overview

01 The Who

02 The What

03 The Why

04 The Where

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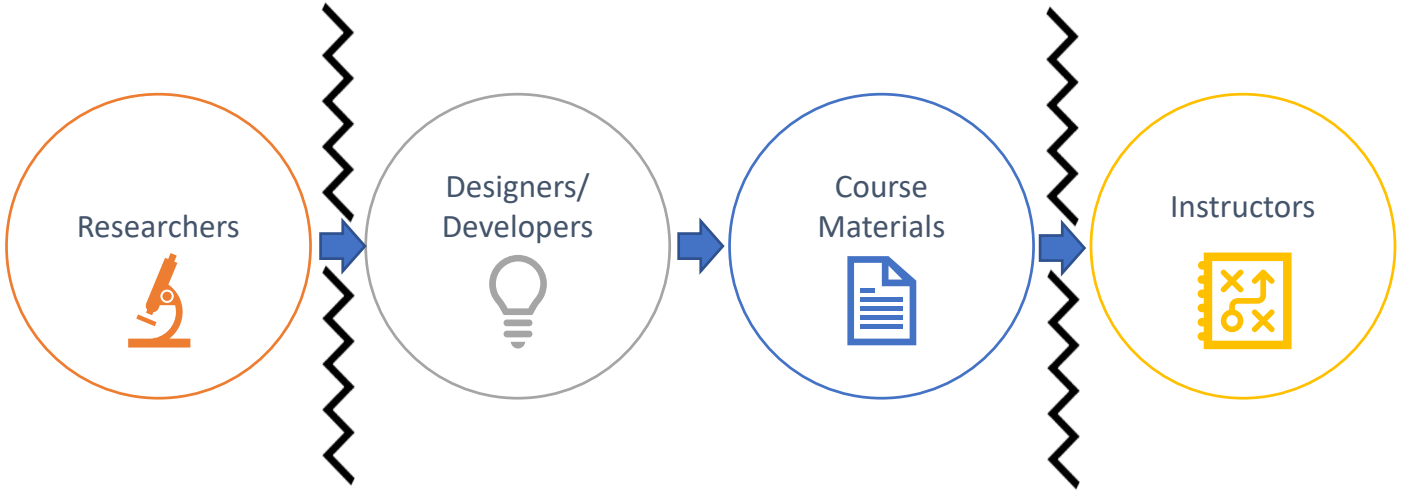
1

THE WHO

Key Players in the Network

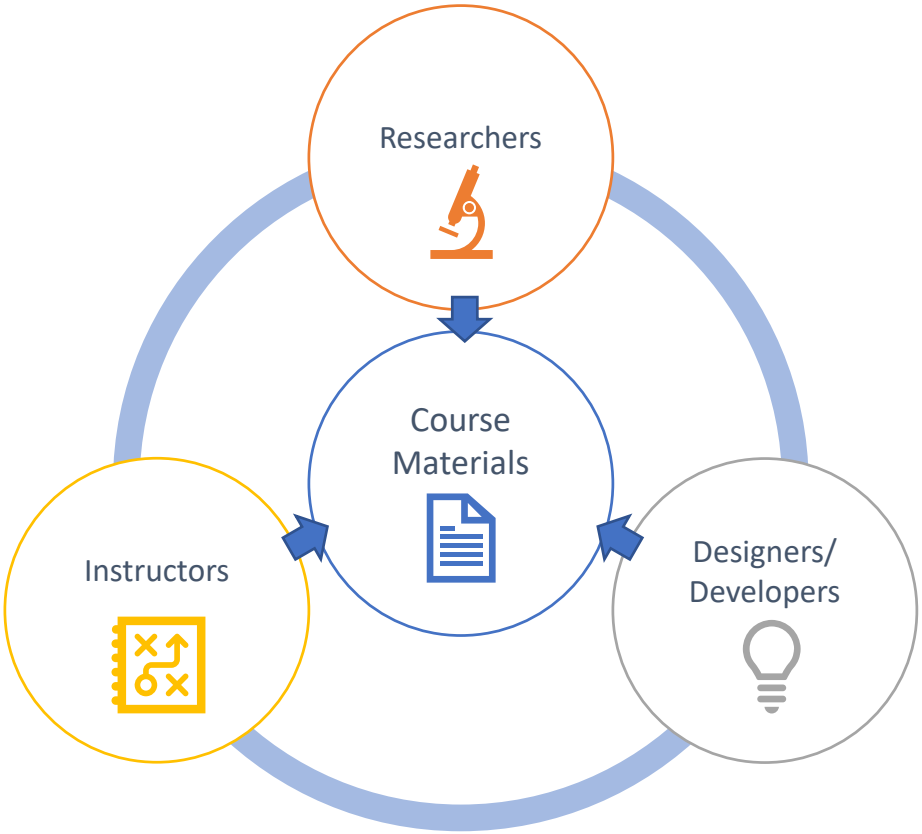
Key Players in Good Instruction



What we're left with:

- Working in silos
- Lack of ecological validity (lab studies, < 1 hour)
- Lack of translational / implementation research
- Persistent gap between research and practice
- Lack of systems focus

Better Book Approach: Vision



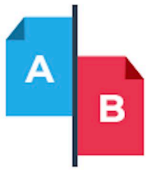
Build R&D communities around development and continuous improvement of high-impact courses

Strategy:
Learn by doing

2

THE WHAT

An Object Around Which to Collaborate



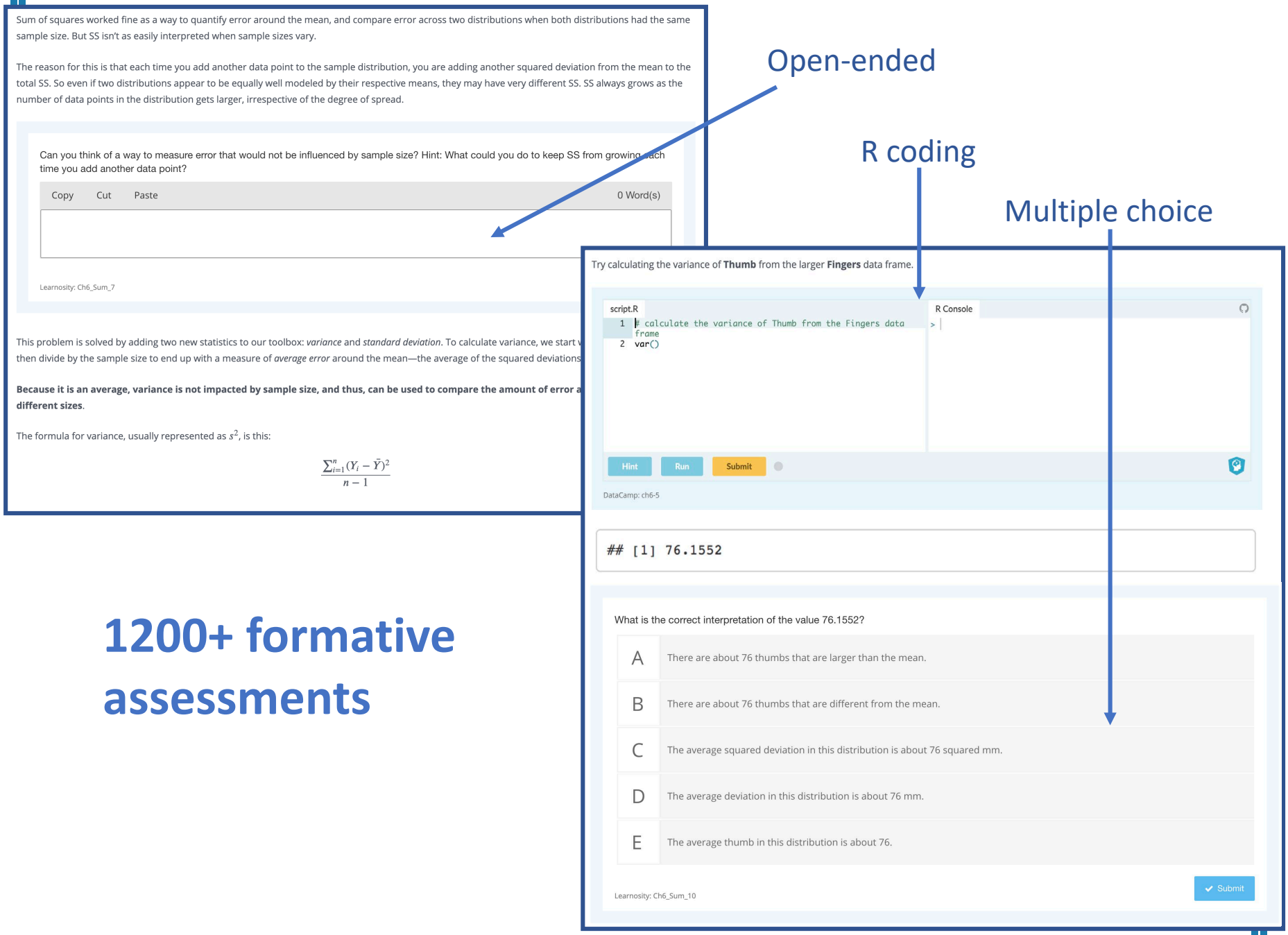
CourseKata

Introduction to Statistics: A Modeling Approach

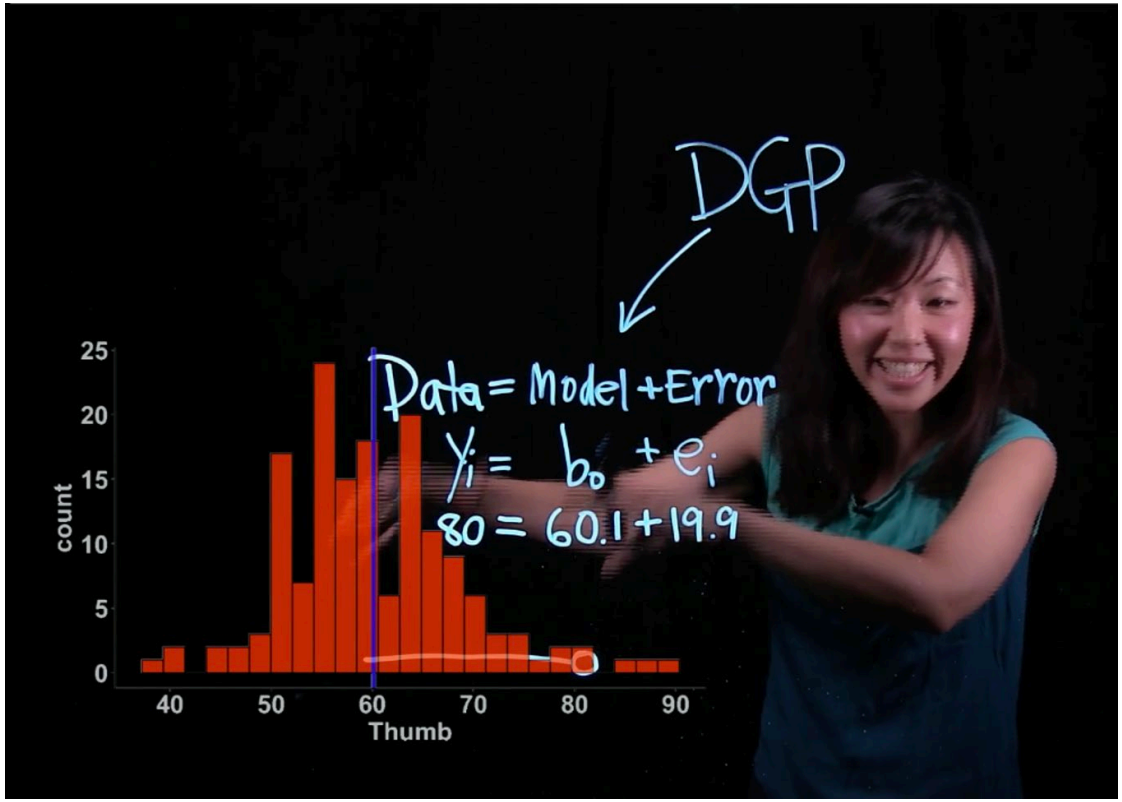
Fully Instrumented Interactive Textbook

"Chapters" with "pages"

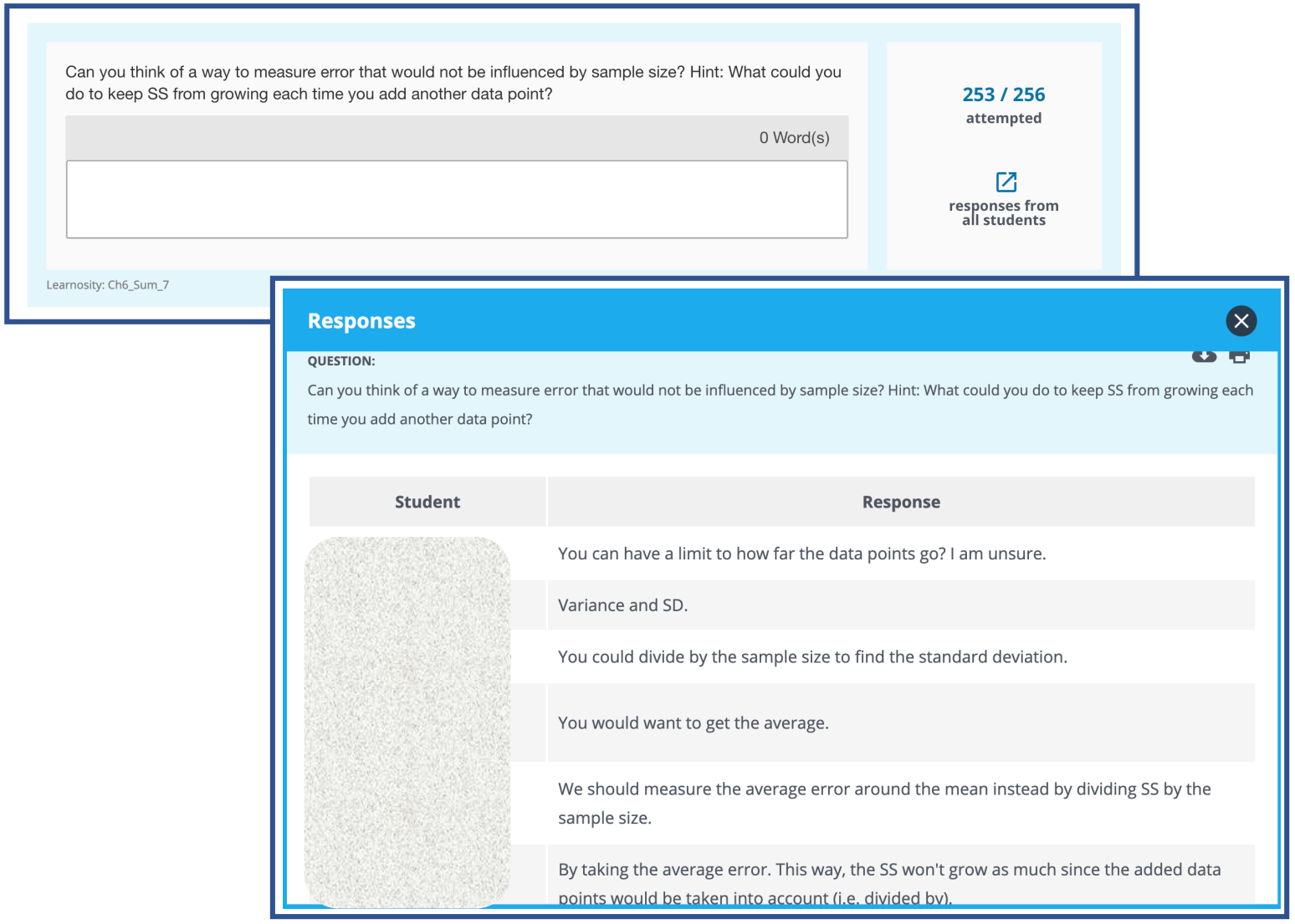
Narrative Interleaved with questions, R exercises, video

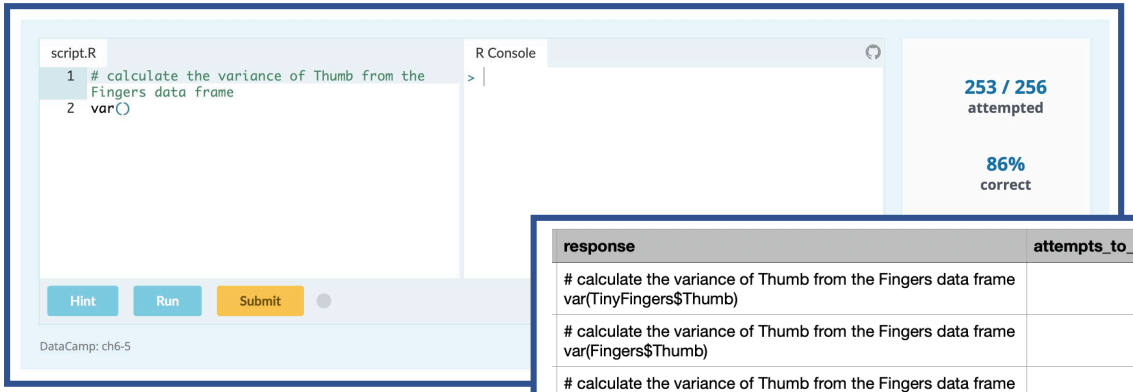


1200+ formative assessments

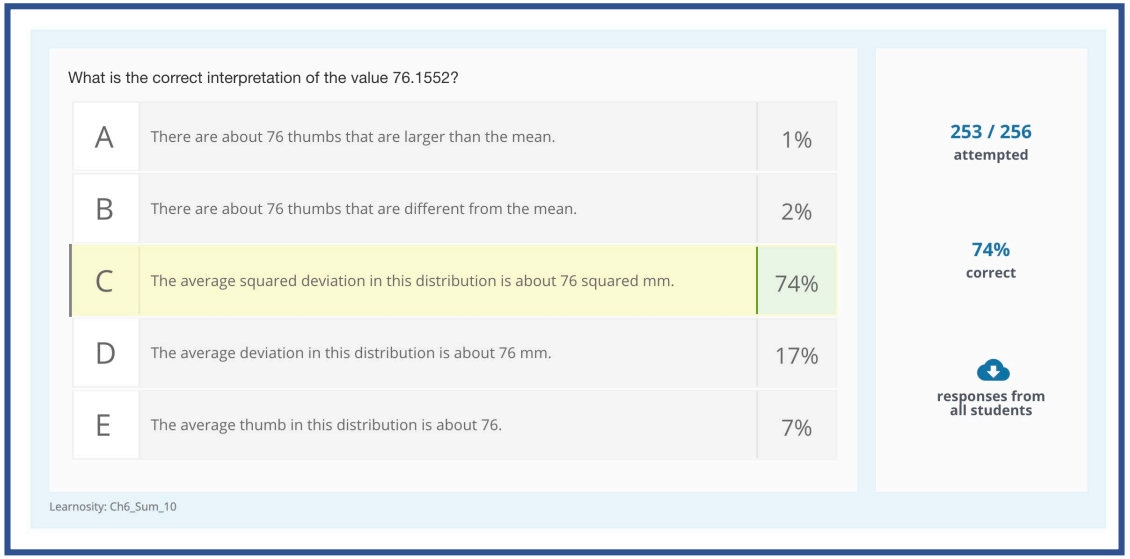

DGP
Data = Model + Error
$Y_i = b_0 + e_i$
80 = 60.1 + 19.9
count
25
20
15
10
5
0
40
50
60
70
80
90
Thumb

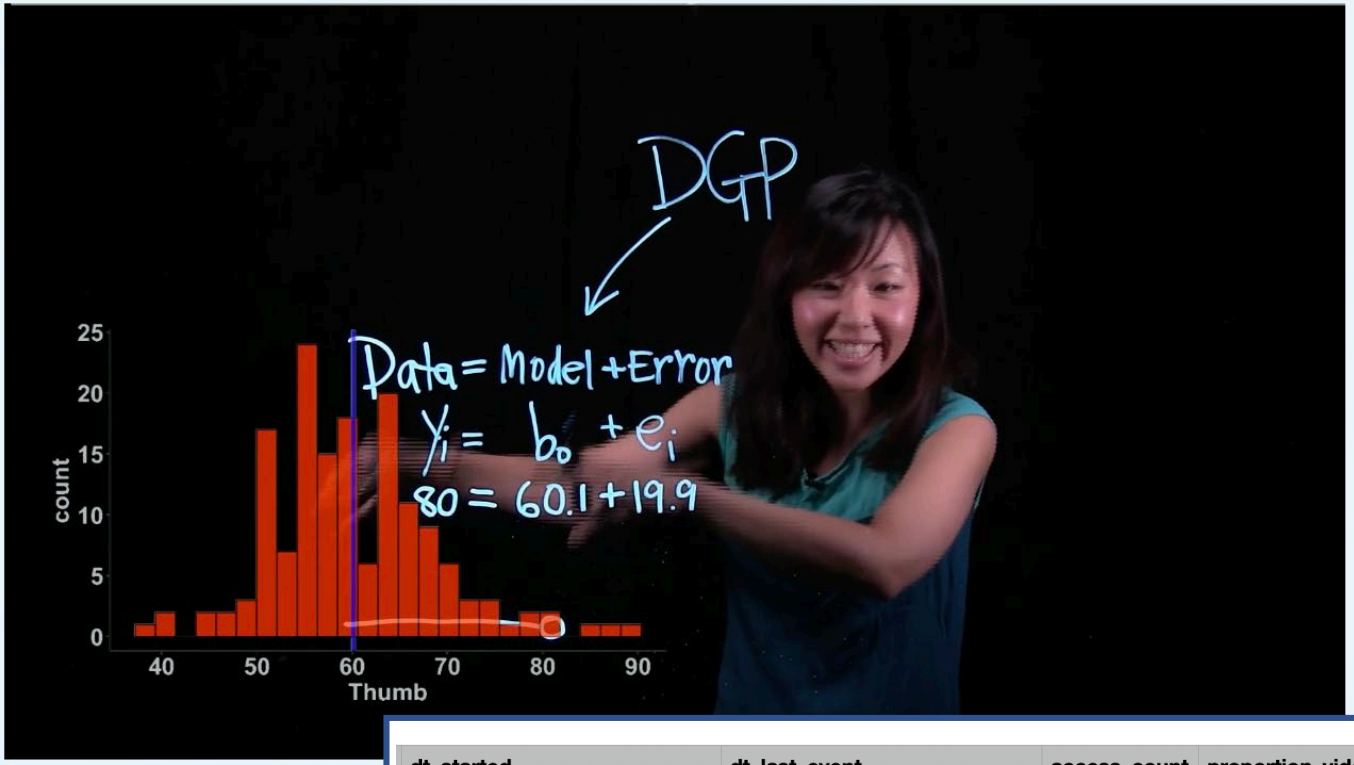
All Activities Generate Data





response	attempts_to_correct
# calculate the variance of Thumb from the Fingers data frame var(TinyFingers$Thumb)	2
# calculate the variance of Thumb from the Fingers data frame var(Fingers$Thumb)	1
# calculate the variance of Thumb from the Fingers data frame var(Fingers$Thumb)	1
# calculate the variance of Thumb from the Fingers data frame var(Fingers$Thumb)	1
# calculate the variance of Thumb from the Fingers data frame var(Thumb$Fingers)	2
# calculate the variance of Thumb from the Fingers data frame var(~Thumb,Data=Fingers)	2
# calculate the variance of Thumb from the Fingers data frame var(Fingers$Thumb)	1
# calculate the variance of Thumb from the Fingers data frame var(~Thumb, data=Fingers)	1





54 / 256
viewed

69%
average percentage of the video viewed

information from all students

dt_started	dt_last_event	access_count	proportion_video	proportion_time
2020-01-23T22:39:38.993+0000	2020-01-31T04:36:09.484+0000	2	1.0	1.982353933028910
2020-01-24T06:14:02.904+0000	2020-01-24T06:19:00.480+0000	1	1.0	1.015842919722100
2020-01-22T18:42:28.826+0000	2020-01-22T18:47:37.916+0000	1	1.0	1.0


Data
Discussion
Course
Improvement

3

THE WHY

The Need for a NIC

Started with ambitious goal:

Transferable knowledge of introductory statistics for all students.

Understanding the Problem

- Statistic
- Parameter
- Sum of squares
- Variance
- Standard deviation
- T-test
- Correlation
- Regression
- Experiment
- Random assignment
- Random sample
- Null hypothesis
- Alternative hypothesis
- Z-score
- Z distribution
- $p < .05$
- Random variable
- Quartiles
- Interquartile range
- Sampling distribution
- Randomization test
- Confidence interval
- Sampling variation
- Model
- Chi-square
- ANOVA
- Normal distribution
- Margin of error
- F-test
- Paired t-test

Common approach:

Define small learning objectives — the *bits* — and teach them to mastery.

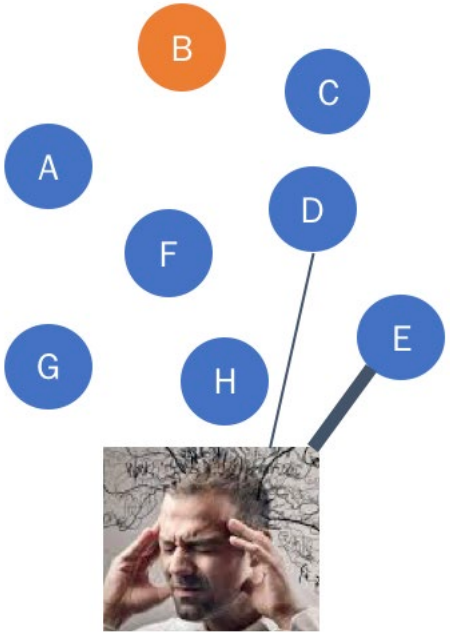
Understanding the Problem

- Statistic
- Parameter
- Sum of squares
- Va
- Sta
- T-t
- Co
- Re
- Ex
- Ra
- Ra
- Null hypothesis
- Alternative hypothesis
- Z-score
- Z distribution
- $p < .05$
- Random variable
- Quartiles
- Normal distribution
- Margin of error
- F-test
- Paired t-test

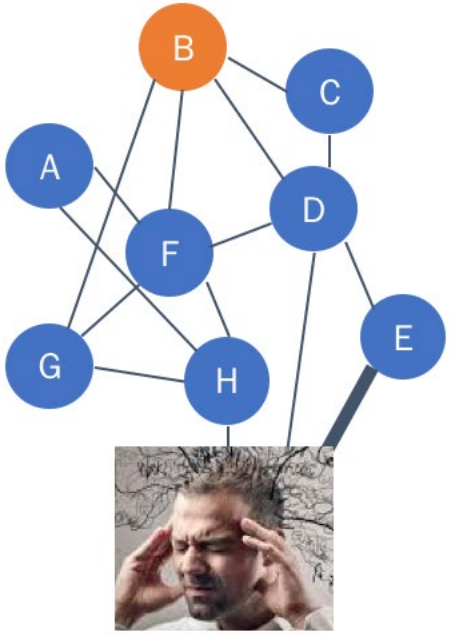
Problem:
Students learn the bits, but often don't see the connections, and can't transfer to new contexts.

Connections and Transfer

Few Connections



Many Connections



Goal: activate, represent, coordinate, and flexibly adapt statistical concepts and skills in novel situations

Theories We're Testing

If the goal is transfer, why not practice transfer?

- *Practicing Connections* to create coherent, flexible knowledge:
  - Core Concepts (form coherent structure of the domain)
  - Representations
  - The World

Testing something so new takes multiple perspectives and a conscious, deliberate process

That's the "WHY"

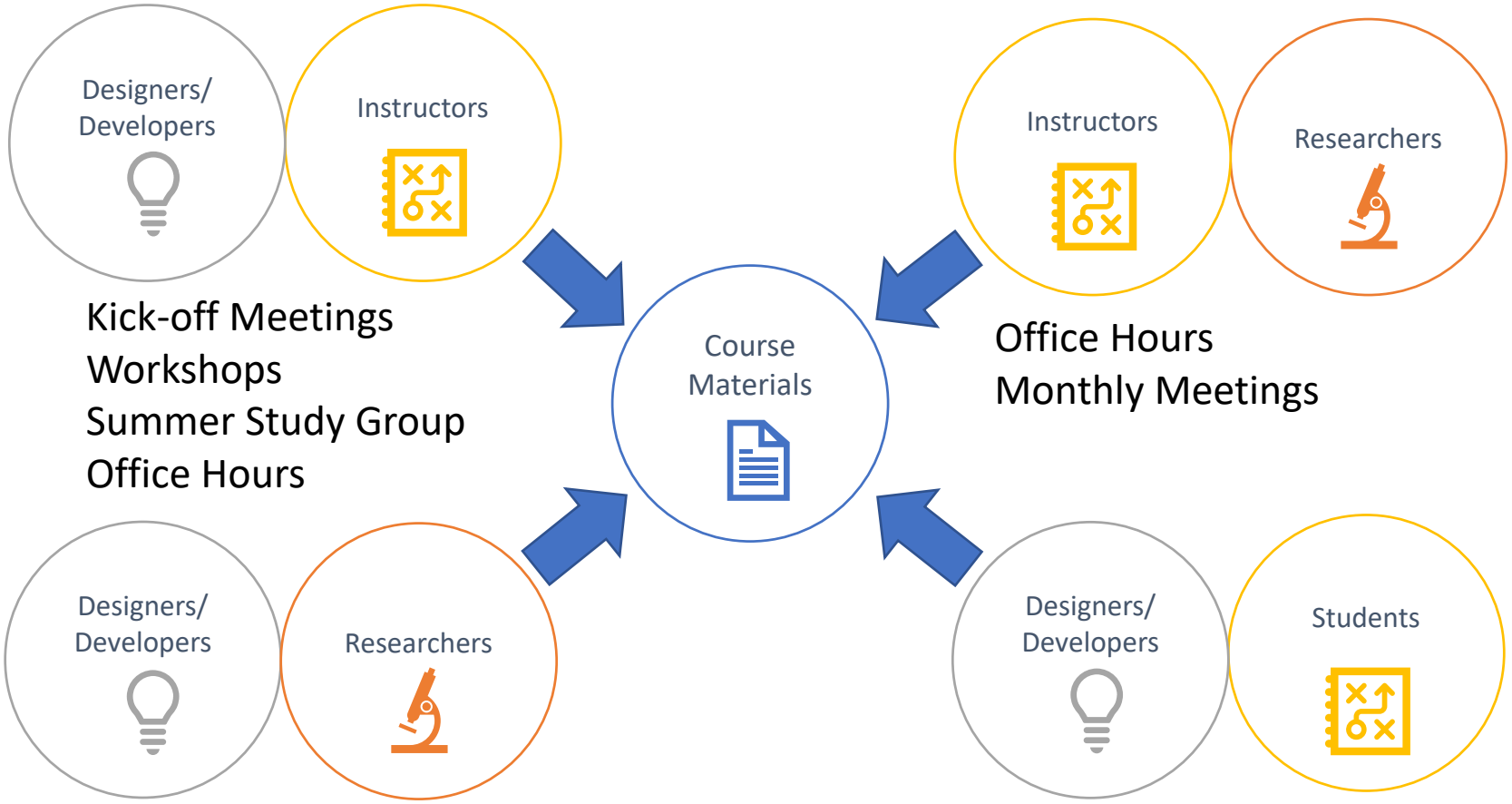
4

THE WHERE

Settings in Which to Do the Work


zoom

The Settings (where and when)



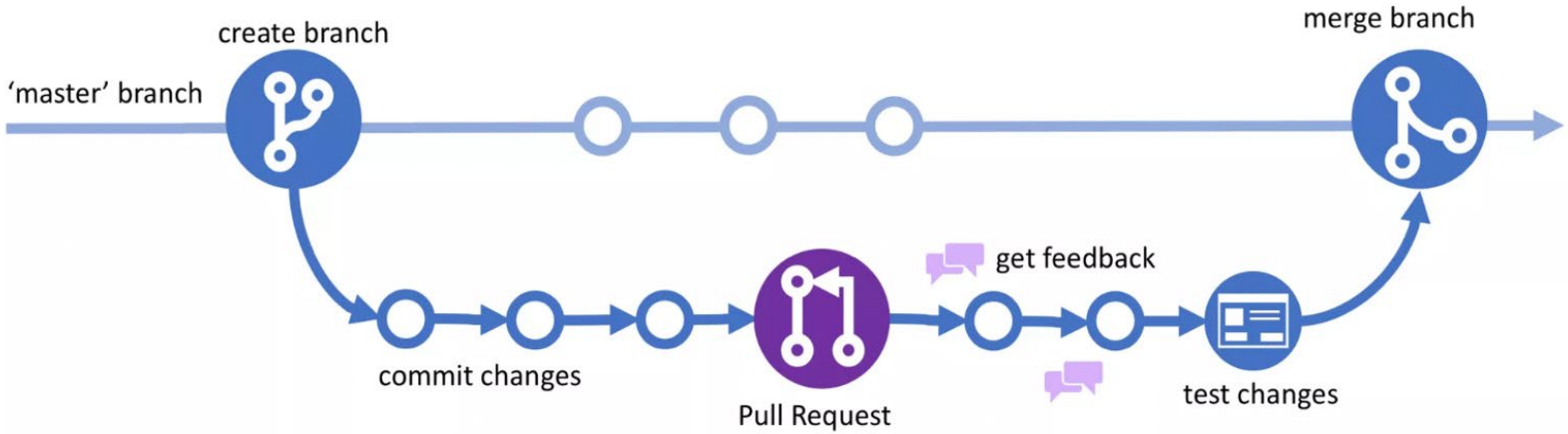
Examples of What We've Learned

Wide Range!

1. Errors that require no discussion
   - Typos
2. Changes managed via discussions in the NICs
   - Teach null model then single explanatory variable, or the reverse?
3. Alternatives that arise via NIC discussions, to be tested with experiments
   - Do videos improve student test performance?

Where We Capture Improvements

Version-control system
Tracks changes in any set of files
Supports distributed, non-linear workflows



5

THE HOW

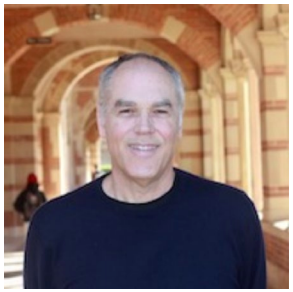
An Attitude of Humility

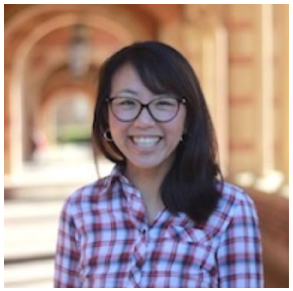
An Attitude of Humility Leads To…

- Readiness – *even eagerness* – to be wrong
- Openness to criticism
- Improvement

CourseKata

Shout out to our amazing team!


Jim Stigler


Ji Son

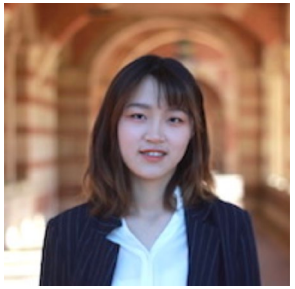

Eddie Tchertchian


Adam Blake


Laura Fries


Mary Tucker


Caylor Davis


Icy Zhang


Ben Winjum

Thank You!